

Green Mountain Power Comments re Implementing Temporary Sound Level Standards

In response to the Public Service Board (“PSB”)’s request for comments and proposals regarding temporary rules for sound levels from wind generation facilities (“Facility”), Green Mountain Power (“GMP”) submits the following comments:

GMP operates Kingdom Community Wind (“KCW”), a 21-turbine facility that generates enough power annually to power 24,000 homes, and has been in operation since late 2012. GMP’s Certificate of Public Good (“CPG”) for the KCW facility limits the sound of wind turbines at any existing residence near the wind plant to levels supported by World Health Organization (“WHO”) community noise guidelines.

Specifically, at any home, the WHO recommends an exterior limit of 45 dB L_{Aeq8h} , the average sound level over the course of an eight-hour night, and an interior limit of 30 dB L_{Aeq} , the average sound level during sleeping time. While the KCW CPG provides sound level limits consistent with these guidelines, the KCW sound level limits are more restrictive in that they apply over a shorter period of time, that being one hour instead of eight hours.

The KCW CPG also requires sound monitoring for the first two years post-construction, to include at least two weeks during all four seasons, and lays out a stringent protocol for responding to complaints.

GMP supports these requirements and has determined that they are appropriate for ensuring operations are in line with regulatory standards. Further, these requirements help to ensure that the KCW facility is a good community neighbor. This model could be replicated for future projects.

Very early in KCW plant operation, GMP discovered that snow buildup on the turbine blades caused the plant to exceed sound standards during four separate one-hour periods of operation. GMP moved quickly to understand the cause, and to prevent it from happening. GMP invested in sophisticated technology, including weather monitoring equipment and video cameras, and made adjustments to its operating procedures. Since those measures were implemented, KCW has not experienced higher sound levels. Concern from residents about sound has faded, and GMP has not had a sound complaint from a resident since August 2015.

The Town of Lowell has embraced and maintained ongoing support for the KCW project. GMP was committed to building the KCW project, provided it had community support. A Town Meeting vote in 2010 showed overwhelming support with 75% of voters supporting the project. Significantly, a subsequent vote was conducted on Town Meeting Day in 2014, after the project was functional, and voter support increased to 80%. In this year’s town annual report, Lowell students submitted drawings of their town, many of which included the turbines. Clearly, KCW has become a welcome part of the local landscape.

It is valuable to hear the experiences of people who live near the turbines in Lowell. We have spoken with people who live as close as 1.15 miles from the nearest turbine to just under three

miles. Some have never heard the turbines from their homes, and some have heard them from time to time, but say the sound has never bothered them. Here are their stories:

Bill Harm lives on Farm Road in Lowell, only 1.15 miles from the turbines. He is one of the closest neighbors to the turbines and has never heard the turbines inside his home. Mr. Harm says, "I have no problem with them at all. You can't hear them, if you can hear them occasionally it sounds like a plane. You don't pay attention and can't even hear them. There is no issue.

Richard Pion lives on Irish Hill Road, approximately one mile from the turbines. "We hear them occasionally outside. We've sat on the deck and sometimes can hear them, but they are nowhere near as loud as the traffic on the main road. They aren't offensive. And often I think the wind in the trees is a lot louder than the turbines."

Leon and Marsha Mason also live on Irish Hill Road, 1.25 miles from the turbines. They have never heard the turbines inside their home and can only recall hearing them outside three times. "We were outside and we thought maybe someone was haying in the distance. We stopped to listen closely and wondered if the sound was just the wind and we realized it was the turbines. We walk up the road a lot and we don't hear them. They don't bother us in the least."

Ruth Michael lives off Route 100, just 1.72 miles from the turbines. She bought the property two years ago, after the turbines had been operating for a year and a half, and has never heard them inside or outside her home. "We sit out in the yard all the time and I've never heard them. The turbines were just not a consideration when we were looking at the property."

Patricia and Steve Mason live on Finnegan Road, 2.3 miles from the turbines. They estimate that they have heard the turbines fewer than 20 times in the last three and a half years, generally late at night when the air is still and there is no traffic on Route 100. "I've never heard them inside the house. But you have to be outside," says Mr. Mason.

Andre LeBlanc lives on Route 100, 2.4 miles from the turbines, and can see all 21 turbines from his home. "Before they were built my concern was noise. And it hasn't come true. I have heard the turbines, but the weather has to be just right. But it is nothing that bothers whatsoever. But you have to be outside. It doesn't bother us at all in the house. The cars are way louder. It is seldom that you hear them."

Rod and Donna Ferguson operate a bed and breakfast on Route 100, 2.98 miles from the turbines. They have never heard the turbines inside their home and only heard the turbines one time outside their home when there was a mechanical issue that was fixed in a few hours. They say their guests are very curious about the turbines. Regarding the effect of the turbines on tourism, Mrs. Ferguson says, "It has been an advantage, not a disadvantage. And I'm not just referring to the workers who stayed here during construction. We have guests who stay here because they have come to Lowell to take the wind tours."

The sound level limits and monitoring requirements specified by the PSB in Docket 7628 have worked well to ensure that noise levels at the KCW plant are consistent with WHO guidelines. The technical details of KCW's sound level limits and methodologies used to evaluate sound levels from the KCW facility are included as a separate Attachment A to these comments.

ATTACHMENT A:

The following specifications for a Facility greater than 500 kW meets the requirements contained in S.260 by setting standards for a Facility greater than 500 kW that do not exceed the lowest maximum limits authorized in any existing CPG issued by the Public Service Board (“PSB”) for facilities greater than 500 kW, and also includes methods for selection of monitoring sites, selection of microphone locations, monitoring equipment, data collection and processing, methodologies to account for background sound levels, and methodologies to determine interior bedroom sound levels, based on the KCW Sound Monitoring Plan approved by the PSB.

- Facility-related sound pressure levels at any existing residences shall not exceed the following limits:
 - a. Exterior sound pressure levels shall not exceed an A-weighted, one-hour equivalent continuous sound level (L_{Aeq1h}) of 45 dB.
 - b. Interior sound pressure levels in bedrooms shall not exceed an A-weighted, one-hour equivalent continuous sound level (L_{Aeq1h}) of 30 dB.
- Wind turbines shall emit no prominent discrete tones at residences. The method for determining the presence of prominent discrete tones is defined in ANSI S-12.9/Part 4 Annex B.
- Before commencing construction, a Sound Monitoring Protocol (“SMP”) shall be submitted to the PSB for approval. The SMP will be in effect from construction through the first two years of operation and shall include:
 - a. Monitoring for low frequency sound with the same regularity as monitoring for all frequencies.
 - b. A monitoring program that includes a variety of seasonal and climate conditions and is designed to confirm compliance with the maximum allowable sound levels described above.
 - c. A means for ensuring that noise monitoring events shall be timed to coincide with those time periods when modeling indicates the likelihood that the noise reduced operation (“NRO”) mode will be triggered.
 - d. Monitoring reports that document each instance when NRO mode is triggered, with a description of how NRO affected operations.
 - e. At the request of a homeowner, monitoring to ensure compliance with the interior noise standard.
 - f. A process for complaint resolution for the life of the project.

- In the event noise from operation of the Facility exceeds the maximum allowable levels, remedial steps shall be undertaken as necessary to bring sound levels produced by the Facility into compliance with allowable levels, and shall include modification or cessation of turbine operation.

In addition to the sound level limits and methodologies used to evaluate sound levels set out in the KCW CPG, GMP suggests that elements of the KCW SMP for consideration. These elements include:

- Monitoring Period Specifications:
 - a. Monitoring shall take place for a continuous period of at least two weeks for nine periods: a construction period and a period in each of the four seasons for the first two years of operation.
 - b. Monitoring periods shall include times when at least 90% of the wind turbines are expected to be operating at their maximum sound power.
- Post-Construction Monitor Site Specifications:
 - a. Monitor site(s) shall be selected in areas within 1.5 miles of the turbine(s).
 - b. Monitor site(s) shall be selected near where pre-construction modeling indicated the highest project-related sound levels could occur, provided permission is granted by land-owners. If permission is not granted, the next closest site, near where the pre-construction modeling indicated the highest project-related sound levels could occur, shall be selected.
- Microphone Location Specifications:
 - a. Microphones shall be located near residences, selected such that influence of reflections of sound from buildings is minimized.
 - b. Microphones shall be placed in a location to avoid potential noise contamination from sources such as flower water, wind chimes, air conditioners, sounds from homes, etc.
 - c. Microphones shall be placed at a height of approximately 3 feet above grade.
 - d. Microphones shall not be placed such that any structure blocks line-of-sight between the microphone and the Facility (if otherwise visible).
 - e. Microphones shall be located and installed in a manner that will maximize the probability of capturing the maximum sound levels at each monitoring location, taking into account all relevant factors such as minimizing line-of-sight obstructions between microphones and the Facility, and maximizing the number of turbines in line-of-sight of the microphones at each monitor site.
- Sound Monitoring Equipment and Data Collection Specifications:
 - a. All sound level meters shall meet Type I or Type II specifications for accuracy as defined in ANSI S1.4.

- b. All sound level meters shall collect 1/3 octave band data from 20 Hz to 10,000 Hz for consecutive periods not to exceed 10 minutes.
- c. Monitors shall also collect audio recordings where permission is granted by the property owner.
- d. All microphones shall be fitted with wind screens that are larger than 3-inches in diameter and designed for measurements in high wind areas.
- Meteorological Data Collection Specifications:
 - a. Wind speed data shall be collected at microphone height at each monitor site in not more than 10-minute increments.
 - b. Temperature and rain data shall be collected from at least one monitor site in not more than 10-minute increments.
- Background Sound Measurement Specifications:
 - a. Background sound level measurements shall be made during the monitoring period and logarithmically subtracted out of the operational sound level measurements resulting in a turbine-only sound level for comparison with the sound level limits.
 - b. Background sound level measurements shall be made in two ways:
 - i. Turbine Shutdown Method: During the monitoring period, all turbines that have a measurable influence over the sound levels at a monitoring location shall be shut down for 20 minutes at a time no less than every eighth hour, provided that hub height wind speeds are such that the wind turbine(s) are near maximum sound power level. Alternatively, the turbines can be shut down for 20 minutes only when monitoring indicates 45 dBA is exceed at a monitoring site.
 - ii. Shielding Method: This method involves two microphone locations. At each site for which this method is feasible, measurements will be made on the turbine side and opposite side of a building when the wind turbine(s) is in operation. The building must provide sufficient attenuation for each octave band to eliminate sound from the Facility.
- Data Processing Specifications:
 - a. Data collected during the following periods shall be excluded from the dataset for purposes of compliance determination:
 - i. When winds exceed 11 miles per hour at microphone height.
 - ii. When temperatures are below 14°F
 - iii. When there is rainfall or heavy snowfall
 - iv. When the Facility is not operating

- v. When there is extraneous noise not due to the Facility such as local property maintenance equipment operating, dogs barking, animals or people interacting with the microphone, etc.
- b. During the summer and potentially spring and fall, insects and birds may be filtered out of the dataset by employing a low pass filter (Ai-weighting) without affecting the sound monitored from the wind turbine(s).
- c. Events over 45 dBA shall be investigated by listening to the recorded audio to determine if the cause is from the Facility. If the exceedance is due to a background sound event, then it may be eliminated from the dataset for purposes of compliance determination.
- Determination of Interior Bedroom Sound Levels:
 - a. If modeling showed, or exterior measurements confirmed, sound levels outside a residence are 40 dBA or greater, and a resident requests it, a test shall be conducted to determine the sound level reduction of the residence.
 - i. The test shall be conducted in the residences bedrooms and in accordance with ASTM Standard E966-10, Standard Guide for Field Measurement of Airborne Sound Insulation of Building Facades and Façade Elements (2010).
 - ii. The test shall be conducted both with the windows open and windows closed.
 - b. For purposes of compliance determination, interior bedroom sound levels will be determined by either:
 - i. Applying a 15 dB reduction to the exterior sound levels at a residence;

Or

 - ii. If it has been measured for a specific residence, applying the measured reduction to the exterior sound levels at a residence.